LEC assets are considerably below current regulatory life prescriptions and, indeed, are very close to the lives being used by the LECs' competitors to depreciate more modern assets.

MiCRA's arguments must be dismissed because they are based on a cursory review of high level regulatory depreciation data, and they do not reflect detailed analyses of technology, new services or competition. Further, MiCRA ignores the implications of legislative and regulatory changes for LECs in the current environment. It also completely ignores the evidence provided by the LECs' discontinuance of FAS 71 accounting. The LECs' determinations that regulatory depreciation accounting is not valid for external financial reporting was based on objective and forward looking evaluations of LEC assets. These determinations were reviewed and validated by the LECs' external auditors.

MiCRA infers that the only good investment decision is one with a long asset life. If that were true, LECs would have few depreciation-related problems, and LEC competitors would be quick to increase their profitability by lengthening their asset lives. As we approach the 21st century, regulators must accept the implications of their depreciation decisions, and act now to reduce asset lives consistent with economic reality. This will enable LECs to fully and rigorously participate in newly competitive telecommunications markets. Failure of regulators to act will further disadvantage the LECs' already difficult economic situation with respect to their large and under-recovered networks.

It is clear that the LECs' regulated reserves and depreciation lives are not adequate. They are based on faulty estimates of useful asset lives. MiCRA's reliance on these estimates is a fatal flaw in its analysis. Accordingly, MiCRA's conclusion that "all is well" with LEC depreciation must be rejected.

APPENDIX A

Technology Futures Telecommunications Studies

1985 Technology's Impact on Lives of Telecommunications Equipment at New York Telephone

1986 Comparisons of Technology Substitutions in Telecommunications and Other Industries

1987 The Effects of Various Levels of Aggregations in Technology Substitutions

1988 Technological Substitution in Transmission Facilities for Local Telecommunications

A Critical Examination of the Future Utilization and Application of Cellular Technology in Telecommunications

1989 Technological Substitution in Switching Equipment for Local Telecommunications

Technological Substitution in Circuit Equipment for Local Telecommunications

Future Technology in the Local Telecommunications Network: An Expert Opinion Survey

1991 Wireless Telephony Market Update: A Quantitative Projection of U.S. Markets

1991-93 NEW TELECOM SERVICES SERIES

Computer Based Imaging and Telecommunications: Forecasts of Markets and Technologies

A Facsimile of the Future: Forecasts of Fax Markets and Technologies

Interactive Multimedia and Telecommunications: Forecasts of Markets and Technologies

Local Area Network Interconnection: Forecasts of Markets and Technologies

Video Communications: Forecasts of Markets and Technologies

Telecommunications for Television/Advanced Television: Forecasts of Markets and Technologies

New Telecommunications Services and the Public Telephone Network

1993 Personal Communications: Perspectives, Forecasts, and Impacts

1994 Transforming the Local Telephone Network: Analyses and Forecasts of Technology Change

1995 Wireless and Cable Voice Services: Forecasts and Competitive Impacts

Depreciation Lives for Telecommunications Equipment

1996 Advanced Video Services: Analysis of Forecasts for Terrestrial Service Providers

APPENDIX B

Depreciation Lives for Telecommunications Equipment:

Review & Update

Local exchange carriers (LECs) have over $250 billion invested in their networks. Over 80% of this investment falls into three categories—outside plant, circuit, and switching. In each category, tremendous changes are underway which are obsoleting the bulk of existing investment and making necessary large amounts of new investment. Since telephone equipment has traditionally been assigned long depreciation lives, these changes mean that existing equipment will be obsolete, and likely out of service, well before existing investment has been recovered under current regulatory depreciation schedules. This report reviews our assessment of the situation and our recommendations for LEC depreciation lives.

Drivers for Change

There are three highly-interrelated drivers that are driving change in telecommunications: technology, competition, and new services. None of these are fully accounted for in the traditional approach to regulatory depreciation. This section briefly reviews these drivers and how they reinforce each other.

Technology Advance

Advances in technology are providing more efficient and functional ways of offering traditional telephone services, as well as wireless services, video services, and new digital communications. Four of the key technologies are:

- Fiber in the loop (FITL), including any architecture that extends fiber into the distribution portion of the local loop. The last link to the customer may be on fiber, copper pairs, coaxial cable, or wireless.

> There are a number of architectures that are under consideration or are being planned. A true consensus has yet to emerge on a single FITL architecture. Continuing changes in technology costs, regulation, business relationships, market forecasts, and market share assumptions probably mean that consensus will be arrived at only gradually. Whatever architecture is chosen, it will displace the vast majority of copper investment.

- Advanced digital switching, especially Asynchronous Transfer Mode (ATM) switching.

> The next major switching generation, ATM switching, is optimized to handle all types of traffic on the network efficiently and quickly. Today's digital switches use time division multiplexing to connect continuous streams of digitized voice or data at 64 Kb/s for the duration of a call. This is efficient for low-speed, circuit-switched applications such as voice, but it is unusable or inefficient for high-speed digital applications, especially those with bursty (non-continuous) traffic characteristics. ATM switches, on the other hand, use small fixed-length packets called cells. Unlike conventional packet switches, ATM switches do not introduce significant signal delay (because of the simple cell structure) which means they can be used for continuous, real-time applications such as voice and videoconferencing. However, since ATM uses packet switching, it is also good for bursty data traffic. The ability to handle all types of traffic, at all variable data rates, not only makes ATM an efficient switch, but it is also ideal for networked multimedia applications that use all types of communications.

• Synchronous Optical Network (SONET) transmission on fiber optic systems, including Next Generation Digital Loop Carrier (NGDLC) systems incorporating SONET.

SONET is a new format for organizing information on a fiber optics channel that recognizes the need for integrating different types of traffic on the same pair of fibers. Among its many advantages are standardized optical and electrical interfaces to which all suppliers must adhere. Another is that an individual information stream on a fiber channel can be efficiently separated from the rest of the information on the channel. With a SONET add-drop multiplexer, any signal can be extracted with a single piece of equipment without breaking down the whole signal. SONET add-drop multiplexers are already cost-competitive with asynchronous equipment, and soon will be commodity items that are integrated into almost every piece of circuit (and switching) equipment. This will render redundant much existing circuit equipment, including digital crossconnects and multiplexers.

Further, with SONET, carriers can mix-and-match circuit equipment so that they can use different manufacturers' equipment. This, of course, provides operational and equipment savings, as well as more competition between manufacturers. Later on, SONET interfaces will be built directly into switches, leading to even more equipment savings. NGDLC systems will directly link to switches through SONET interfaces. From the same unit, some channels may be connected to other switches or facilities using a built-in SONET add-drop multiplexer. Circuits could be transferred from one switch to another instantaneously. This will give carriers much more flexibility when it comes to dealing with switch manufacturers. SONET will benefit customers as well as carriers. In addition to the inherent economic benefits of a more efficient network, SONET will provide greater reliability through its support of fiber ring architectures and enhanced response time and flexibility in provisioning new channels.

• High-capacity digital wireless technologies such as Time Division Multiple Access (TDMA) and Code Division Multiple Access (CDMA).

These digital wireless technologies can multiply the capacity of existing cellular systems by a factor of from three to 10 and will also be utilized with the new personal communications systems. One implication of the increased capacity is the ability to compete more directly with wireline service.

In a nutshell, the benefits of these technologies are reduced operating costs, reduced capital costs, better service, or, in some cases, new services. The technologies are all well-understood and do not require scientific, engineering, or economic breakthroughs to be deployed. There is widespread agreement about their benefits and cost targets. While there is some controversy about the details and timing, there is consensus that the future of telecommunications is built around these technologies.

Competition

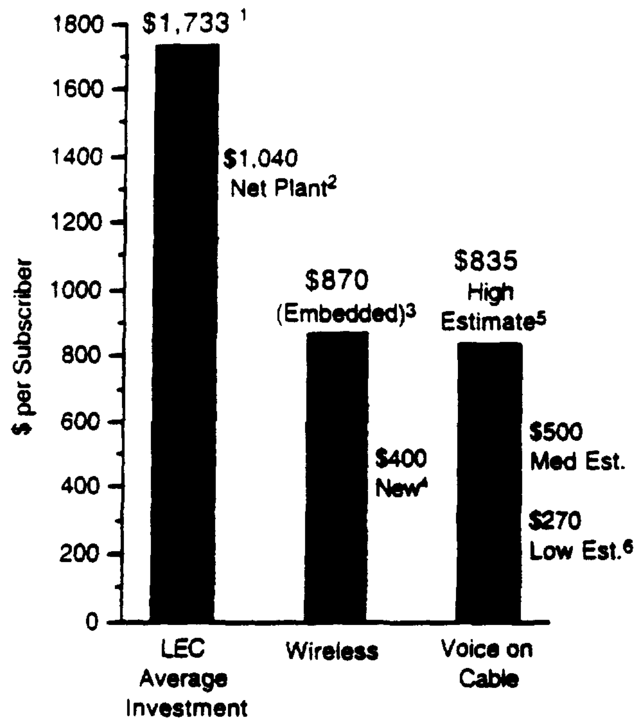
Competition has entered the local exchange business, and it will increase dramatically over the next few years. So far, most local exchange competition has centered on the large business customer. Competitive access providers (CAPs) are already serving large businesses in concentrated areas, and cable television companies are providing alternative access for high-bandwidth services. CAPs are installing the latest, most efficient technology—fiber optics, SONET, and, in cities/ locations where they provide switched services, modern digital switching.

The next competitive arena will be the mass market for voice services. Such competition has already begun in public phones and, in some states, in intra-LATA long distance. Two additional, more pervasive sources of competition are cable television networks and wireless networks, specifically cellular and personal communications services (PCS). Technologies are emerging that will allow voice to be added to state-of-the-art cable systems at a cost that is less than on copper pairs. On a per-subscriber basis, cellular technologies are already less costly than wireline. With the new high-capacity digital wireless technologies, such as TDMA and especially CDMA, wireless technologies will also be less costly on a per-minute of use basis. Exhibit 1 illustrates some of these cost comparisons.

Because they are more efficient, the new technologies offer very substantial cost advantages to new entrants in local telecommunications. These new entrants can invest in the most efficient modern equipment without regard to an embedded infrastructure such as the LECs have. This, in turn, will pressure LECs to adopt new technology quickly in order to stay competitive. Thus, competition reinforces the technology drivers and magnifies the obsolescence of the old technology.

Exhibit 1

Investment Per Subscriber



Source: USTA Engineering Subcommittee on Depreciation

[1] Industry investment of $260 billion and 150 million access lines at year-end 1993.
[2] Net plant assumes 40% depreciation reserve (industry average at year-end 1993).
[3] Total wireless industry investment divided by number of customers (source: CTIA, year-end 1993).
[4] Annual wireless industry investment increase divided by customers gained (source: CTIA, year-end 1993).
[5] Estimate by Hatfield Associates, Inc. in a 1994 study for MCI, Alternative Distribution and Access Technologies. Includes land and buildings, switch, network interface unit, backhaul, and customer connection (similar to fee paid by cellular to sales agent, $320).
[6] Estimate by David P. Reed in "The Prospects for Competition in the Subscriber Loop: The Fiber-to-the-Neighborhood Approach," presented at the 21st Annual Telecommunications Research Policy Conference (September 1993). It represents costs allocated to telephony for upgrading a cable system for interactive TV and telephony.

New Services

The third driver is the impending emergence of digital communications services for the mass market. These services will support both television and computer-based applications requiring digitized transmission of text, audio, and still and moving images. The applications for these services include advanced fax, computer-based imaging, LAN interconnection, videoconferencing, interactive multimedia, video on demand, and interactive television. Today, the market for digital communications services for these applications is relatively small: however, the potential for growth is tremendous, especially when these services are extended beyond large business customers.

Ultimately, the telephone network will provide full broadband, multimedia communications services based on three of the technologies we have mentioned: fiber optics, SONET transmission, and ATM switching. Along the way, intermediate steps will include narrowband Integrated Services Digital Network (ISDN) and video on demand services. Since some of the new services blur the traditional distinctions between telephony, television, publishing, information systems, and computing, they foster a new type of competition focused on the convergence of these industries. In this environment, competitive advantages belong to those companies that can deliver a package of diverse services for the least cost. As it happens, the new technologies allow delivery of multiple services at overall costs that are comparable or less than the traditional delivery mechanisms for the individual services.

Impacts on Depreciation Lives

Alone, any one of these drivers would cause significant change in the deployment of technology. Together, they are forcing unprecedented change that is rendering most of today's telephone network obsolete. Although satisfactory for voice services, today's network is expensive to operate and offers limited functionality in terms of mobility and digital services. It was optimized and constructed for the age of electromechanical and analog switching and copper cable, an age which for a decade has been giving way to digital switching and fiber optics. Much of the equipment placed in the last decade is becoming obsolete in the face of new technologies such as SONET and ATM. Thus, if LECs are to remain viable, they must rebuild their networks—sooner rather than later. This necessitates continued, massive investment in new technology that requires much shorter lives for existing investment than are currently prescribed by regulators.

Weaknesses in Regulatory Depreciation Methods

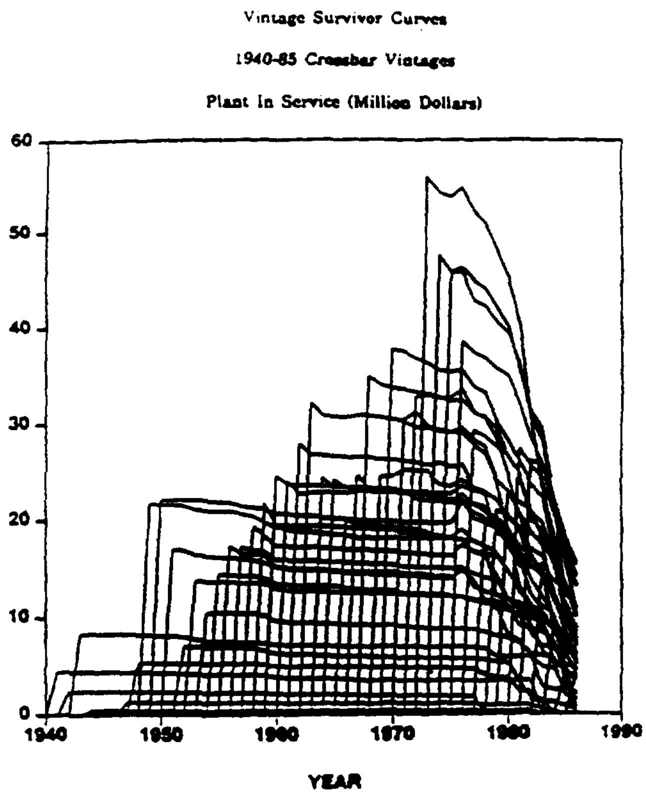
The traditional method for estimating depreciation lives is to examine mortality data for older vintages and assume that all vintages will experience the same age-dependent characteristics. For example, if 60% of the units of a particular technology installed in 1983 were still in service in 1989 (six years later), we would assume that 60% of the units installed in 1990 would still be in service in 1996 (again, six years later). (This greatly over-simplifies, but captures the basic idea.) The assumption of age-dependent retirements reflects a situation where wear-out or breakdown drives the replacement process. Under this model, new technology (or perhaps a new unit of old technology) replaces old technology only when the old technology wears out or breaks. This is an accurate model for some situations: for example, it reflects the way most companies replace motor vehicles.

Today, however, technological obsolescence is a major cause of retirements in telecommunications for switching and circuit equipment, and is also expected to be for outside plant in the near future. (Other drivers—competition and new services—are largely reflected in this driver.) Mortality analysis alone is not appropriate in such a situation. This is made clear in Exhibit 2, which plots the vintage survivor curves for crossbar switching. These are similar to normal survivor curves except that a separate investment life cycle is shown for each vintage of equipment. Note the "avalanche effect" between 1975 and 1980. During this period, all vintages experienced sudden and simultaneous retirements, as electronic switching was rapidly adopted.

One can also see from the avalanche curves that, when technological obsolescence is the major driver for retirements, there is no such thing as a constant service life. Equipment purchased late in a technology generation will have a much shorter life than a piece of equipment purchased earlier. Further, the expected service life of equipment purchased late in the cycle is roughly the same as the average remaining life of existing equipment. These observations are contrary to mortality-based depreciation, but they reflect reality.

Most important, until the avalanche begins, life estimates for the old technology using mortality-based analysis will be based on an extension of the pre-avalanche trend and, thus, will be way too long. Not only will the life estimates be wrong, but they will be wrong right up to the moment the avalanche begins. To use a different metaphor, this is like paddling a rowboat without ever looking forward. You are over the falls before you know anything is wrong!

Exhibit 2
Avalanche Curves



Source: Bellcore

The original replacement technology for crossbar switching was analog stored program control (ASPC) switching, first introduced in the mid-to-late 1960s. Note that the avalanche of crossbar retirements begins in about 1975, more than five years after the introduction of the new technology.

Also note that very large amounts of investment were made in the old technology very late in its life cycle, even after the new technology was available. Although this behavior may seem odd, it is typical of many technologies and can often be perfectly rational. (For example, millions of 486 personal computers have been sold since the introduction of the replacement technology, the Pentium.) It can result from several factors:

(1) The need to maintain existing equipment and service levels.

(2) Restrictions on the availability of the new technology.

(3) High relative costs for the new technology early in its life cycle.

(4) An inherent bias toward the existing technology.

However, we must keep in mind that the last purchases of old technology will have especially short lives.

An important implication of this phenomenon is that recent investment patterns in the old technology tell us little about the likely adoption of new technology, even in the near future. Purchase volumes of the new technology may be smaller than those of the old technology almost to the time the avalanche begins.

Using Technology Forecasting to Estimate Depreciation Lives

Fortunately, there are reliable methods that allow us to forecast future technology changes and, thus, depreciation lives. Developed and tested over many years in telecommunications and other industries, these methods have proven to be very reliable for forecasting. Their basis lies in an understanding of the process of technology change and the use of available data to produce quantitative forecasts.

One technology forecasting method, substitution analysis, has been proven effective in projecting the adoption of new technologies and the obsolescence of old technologies. Substitution refers to the displacement of an established technology by a newer technology when the new technology provides substantially improved capabilities, performance, or economies. With substitution, technological superiority of the new technology—not wear-out—is the driver for replacement.

With substitution analysis, we examine patterns of technology substitution. The pattern is remarkably consistent from one substitution to another, and is characterized by an S-shaped curve when the market share of the new technology is plotted over time. Exhibit 3 shows the S-shaped curve for the Fisher-Pry model. Of the several substitution models available, in general, we have found the Fisher-Pry model—and its extensions, notably, multiple substitution models based on the same principles—to be the most useful for forecasting. The adoption of a new technology starts slowly because, when it is first introduced, a new technology is usually expensive, unfamiliar, and imperfect. The old technology, on the other hand, has economies of scale and is well-known and mature. As the new technology improves, it finds more and more applications, it achieves economies of scale and other economic efficiencies, and it becomes generally recognized as superior. The old technology, because of its inherent limitations and falling market share, cannot keep up. The result is a period of rapid adoption of the new technology, beginning at the 10% to 20% penetration level. This corresponds with a period of rapid abandonment of the old technology, i.e., the avalanche. Toward the end of the substitution, adoption of the new technology slows down again as the last strongholds of the old technology are penetrated.

Since the pattern of how a new technology replaces an old one is consistent, we can apply the pattern to a technology substitution in progress, or one just beginning, to forecast the remainder of the substitution and estimate the end date for the old technology. We can apply substitution analysis even in cases where the substitution has yet to begin by using appropriate analogies, precursor trends, or evaluation of the driving forces. More information on the Fisher-Pry model and its application is provided in Attachment 1.

ATTACHMENT 13

USTA
CALCULATION OF
DEPRECIATION RESERVE CATCH-UP

USTA COMMENTS
CC DOCKET NO. 96-262
JANUARY 29, 1997

Calculation of Depreciation Reserve Catch-Up

The ILECs calculated the amount of past under-depreciation (i.e., a depreciation reserve catch-up) using a standard theoretical reserve calculation. The specific theoretical reserve calculation utilized here is the one prescribed by the FCC in its depreciation study procedures. (See, e.g., The Federal Communications Commission Depreciation Study Guide 1996, the latest version available from the FCC.) Copies of the relevant pages from the FCC's procedures are attached.

This theoretical reserve calculation is a measure of the adequacy of past accounting allocations of cost, assuming straight-line depreciation. The theoretical reserve is not a calculation of what the reserve should be based upon other methods of economic valuation, such as those using the past and future cash flows attributable to the plant, or the past and future replacement values of the plant. In this sense, this ILEC catch-up calculation is a reasonable yet conservative estimate of the past under-depreciation problem. These other methods (cash flow, replacement value) are also reasonable methods and typically yield larger estimates. By using the same method for each of the ILECs, USTA presents a conservative and consistent estimate for the total under-depreciation amount for this group of ILECs, recognizing that ILECs may utilize other less conservative methods for their individual showings.

The size of the ILECs' depreciation reserve catch-up also necessarily presumes that ongoing depreciation is corrected (i.e., future depreciation is based upon the same economic lives used in the historical theoretical reserve calculation). Absent this change to economic lives for future depreciation, additional under-depreciation would be accumulated each year.

Specifically, the depreciation reserve catch-up is the difference between the theoretical reserve and the booked depreciation reserve. The theoretical reserve is often characterized as the level of reserve that would exist at a point in time if the correct lives and net salvage parameters had been used for depreciation from the beginning. To arrive at the theoretical reserve level, the calculation essentially subtracts the future amounts that should be added to the depreciation reserves (i.e., the annual depreciation accruals) from the total value of the plant to be depreciated.

The theoretical reserve calculation for each ILEC is based upon: (a) its economic lives and net salvage parameters, consistent with its financial reporting; and (b) its estimated end-of-year 1996 plant levels. The booked depreciation reserves for each ILEC are estimated end-of-year 1996 amounts on a FCC-reported basis.

For a specific account, the calculated theoretical reserve can be smaller than the booked reserve amount. In such a case, a booked reserve surplus would result for that specific account. Any such surpluses have been properly reflected as reductions to the total catch-up amounts presented here.

This calculation represents the total depreciation reserve catch-up amounts for the following group of ILECs that subject to the FCC's depreciation prescription procedures and regulations and that are also price cap LECs. These LECs are:

Ameritech	Pacific Telesis
Bell Atlantic	SNET
BellSouth	SWBT
GTE	U S West
NYNEX	

Specific theoretical reserve and depreciation reserve catch-up calculations were performed by accounts for each of these ILECs except Ameritech. However, an approximate amount for Ameritech has been included in the total amount of the catch-up using a "gross-up" based on end-of-year 1995 access lines for each of these ILECs.

The amount of the depreciation reserve catch-up amount, determined using the exact procedures and formulas outlined by the FCC in its Depreciation Study Guide, 1996, is approximately $17.9 billion on an unseparated (intrastate plus interstate) basis. The interstate portion of this amount is approximately $4.5 billion. If that interstate amount were utilized to establish an amortization over five years, the amortization would be approximately $897 million per year for the total of these nine price cap LECs.

Estimated End-of Year 1996 Depreciation Catch-Up

Company	Access[1] Lines	Unseparated Reserve Catch-Up Amounts ($000)	Interstate Reserve Catch-Up Amounts ($000)
Ameritech	19,057,000	- - -[2]	- - -
Bell Atlantic	19,603,013	$2,673,339	$739,810
BellSouth	21,158,278	$2,643,524	$579,371
GTE	17,609,027	$3,141,801	$816,500
NYNEX	17,138,000	$668,300	$157,600
Pacific Telesis	15,782,000	$2,343,679	$524,457
SNET	2,030,712	$657,300	$173,411
Southwestern Bell	16,343,359	$1,759,442	$462,873
US West	14,544,666	$1,699,419	$446,058
Total of Above	143,266,055	15,586,804	$3,900,080
Total w/o Ameritech)	124,209,055	$15,586,804	$3,900,080
Gross-Up Ratio[3]	1.15		
Total for Nine Price Cap LECs		**$17,924,825**	**$4,485,092**

December 31, 1995 access line data is from the USTA 1996 Holding Company Report.

Ameritech reserve catch-up amounts were not available for inclusion here.

Gross-up ratio used here is the ratio of total access lines with Ameritech to total access lines without Ameritech.

ATTACHMENT 14

AFFIDAVIT
LAWRENCE VANSTON
TECHNOLOGY FUTURES, INC.

USTA COMMENTS
CC DOCKET NO. 96-262
JANUARY 29, 1997

Affidavit
Lawrence Vanston, Technology Futures, Inc.

Technology Futures, Inc. (TFI) has reviewed the projection lives used for financial reporting by the following Local Exchange Carriers (LECs): Bell Atlantic, BellSouth, GTE, NYNEX, Pacific Bell, Southern New England Telephone, Southwestern Bell, and US WEST. With the exceptions noted below, these lives are within, or above, the ranges recommended by TFI for embedded equipment in each of the following major network technology accounts:

Account	TFI Recommended Life (Embedded Eqp.)
Digital Switching	9-11 years
Digital Circuit	8-9 years
Metallic Cable	14-16 years
Fiber	15-20 years

The TFI recommendations are based on extensive technology forecasts that TFI has conducted on behalf of the Telecommunications Technology Forecasting Group and summarized in *Depreciation Lives for Telecommunications Equipment--Review and Update*, Technology Futures, Inc., 1995.

Please note that the above lives are intended to apply to the embedded base of LEC investment; projection lives may be significantly shorter for newly-placed equipment that face obsolescence over the next ten years. Also, the TFI recommended lives are "economic" in that they capture the economic imperative to modernize LEC networks and the loss in value due to technological obsolescence. They do not, however, reflect the full impact of competition on the value of telecommunications equipment or on LEC cash flows. TFI studies indicate that, for metallic cable at least, true economic lives are significantly shorter than indicated above.

There are a few instances where an LEC uses a life below the TFI recommended range for a particular account. Southern New England Telephone uses 10.5 years for buried metallic cable and 12 years for aerial and underground metallic cable. Its geographic and competitive situation, as well as specific network modernization plans, justify these lives. Similarly, BellSouth's use of 12 years for underground metallic cable is justified by its aggressive adoption of feeder and interoffice fiber. Southwestern Bell uses 7 years for digital circuit equipment. However, TFI's recommendation of 8 years for this account reflects only the substitution of SONET for non-SONET equipment and inter-generational modernization of SONET equipment. Other obsolescence and mortality factors exist for non-SONET equipment, and, thus, the 7 year life for digital circuit equipment is reasonable.

TFI is an independent research institution established in 1978. It specializes in technology forecasting and strategic planning, both within and outside the telecommunications industry. TFI has continuously performed technology forecasts in the telecommunications area since 1984. In addition to its research and consulting activities, TFI conducts the public seminar, *Technology Forecasting for the Telecommunications Industry*, and publishes the research journal, *New Telecom Quarterly*.

Lawrence Vanston
President, Technology Futures, Inc

Jan 20, 1997
Date

ATTACHMENT 15

"THE DEPRECIATION SHORTFALL"

Jeffrey H. Rohlfs, Charles L. Jackson and Ross M. Richardson
Strategic Policy Research

USTA COMMENTS
CC DOCKET NO. 96-262
JANUARY 29, 1997

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The Depreciation Shortfall

Jeffrey H. Rohlfs
Charles L. Jackson
Ross M. Richardson*

January 29, 1997

* The authors are principals in Strategic Policy Research, Inc., an economics and public policy consulting firm located in Bethesda, Maryland. Dr. Rohlfs formerly served as Head of Economic Modeling Research at Bell Labs. Dr. Jackson formerly served as Chief Engineer on the Staff of the House Telecommunications Subcommittee and Engineering Assistant to FCC Commissioner Glen O. Robinson. Mr. Richardson formerly served as Member of Technical Staff in the Network Systems Division of AT&T's Bell Laboratories and subsequently as Principal Member of Technical Staff for Architecture at Southwestern Bell Corporation (SBC) Technology Resources. The authors have authored many studies on economic depreciation and regulatory depreciation policy.

Table of Contents

I. Introduction

For decades, state and federal regulators have required local exchange carriers (LECs) to depreciate their plant slowly. Regulators chose low depreciation rates in order to reduce cost-based prices in the short term. As a result, there is now a large "depreciation shortfall"; *i.e.*, the disparity between the regulatory book value of plant and its economic value in use. A change in regulatory policy is essential if the new Communications Act is to be effectively implemented. In this paper, we adduce a variety of evidence that quantifies the depreciation shortfall.

Reserve-shortfall estimates based on accounting methodology were developed by the price-cap LECs that are fully subject to depreciation regulation. The LECs estimate that depreciation reserves should be 54.0 percent instead of the actual value of 47.0 percent; the estimated shortfall is 7.0 percent of gross plant or $18 billion.

In this paper, we first explain the methods that the LECs used. We then evaluate the reasonableness of their estimates on the basis of our knowledge of telecommunications technology and markets. In summary, the LECs' conservative estimates, which are based on accounting methods, do not fully reflect declines in economic values of plant. These estimates constitute a conservative view of the capital-recovery problem. The actual problem, taking declines in economic values fully into account, is almost surely worse (and may be considerably worse) than implied by the LECs' conservative estimates.

The depreciation shortfall is greatest for copper cable. Technological improvements in fiber-optic systems are continually driving down the economic value of copper plant. Fiber-optics is already cost-effective for feeder loops. In that sense, copper feeder loops are already obsolete. Fiber technology will ultimately obsolete copper distribution plant, as well.

The depreciation shortfall for digital switching plant is also substantial. Switch prices are declining at a significant rate. In addition, current switches are becoming obsolete, in part as a result of the growth of computer networking; *e.g.*, on the Internet. These factors drive down the economic value of switching investment.

We also examine several sources of evidence that confirm the finding of a large depreciation shortfall. We observe that other (more-lightly regulated) telecommunications firms with similar types of plant depreciate the same plant much more rapidly than LECs. We also examine the Hatfield Model and the Federal Communications Commission's (FCC's) proxy costs. Both imply